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28 October 2004

The International Bureau of WIPO
34 Chemin des Colombettes
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"Amendment of the claims under Article 19(1) (Rule 46)"

Re: International Application No. PCT/JP2004/007003
International Filing Date: 17 May 2004
Applicant: Matsushita Electric Industrial Co., Ltd.
Agent: IKEUCHI SATO & PARTNER PATENT ATTORNEYS
Our Ref.: H2112-01

Dear Sirs:

The Applicant, who received the International Search Report relating to the above-identified International Application transmitted on 7 September 2004, hereby files amendment under Article 19(1) as in the attached sheets.

That is, claims 1, 3, 4, 17 and 18 are amended, claims 2 and 8-16 are canceled and claims 5-7, 19 and 20 are retained unchanged.

The Applicant also files as attached herewith a brief statement explaining the amendment and indicating any impact that amendment therein might have on the description and drawings.

Sincerely yours,

Hiroyuki Ikeuchi

IKEUCHI SATO & PARTNER PATENT ATTORNEYS
Representative Partner
Hiroyuki IKEUCHI

Attachment:
(1) Amendment under Article 19(1) 4 sheets
(2) Brief Statement 1 sheet

Explanation under the provision of PCT Article 19(1) (PCT regulations 46.4)

1. Explanation of Amendment

Claim 1 is combined with claim 2 into a new claim 1. Correspondingly, claim 2 is canceled, and claims 17 and 18 are amended to depend from the new claim 1. The features of claims 3 and 4 that overlap with those of the new claim 1 are removed. Moreover, claims 8 to 16 are canceled.

2. Comparison between the present invention and the references

According to the present invention, it is possible not only to correct aberrations with the entire lens system, but also to prevent degradation of the quality of a projected image by satisfying the conditional expression (1) (page 4, line 14 to page 5, line 2 and page 19, lines 10–21 of the specification; corresponding to page 4, line 25 to page 5, line 16 and page 19, line 21 to page 20, line 12 of the English translation). In contrast, none of the examples in each of the references meet the conditional expression (1). Therefore, the novelty and inventive step of the present invention cannot be denied by the references.

CLAIMS

1. (Amended) A zoom lens used as a projection lens of a projector in which a prism is located between the projection lens and a spatial optical modulating element,

wherein a lens closest to the spatial optical modulating element is a meniscus positive lens whose convex surface faces a screen, and a refractive index of the meniscus positive lens is 1.75 or more, and

wherein the following conditional expression (1) is satisfied:

$$(1) \quad -0.3 < (GLR1/GLnd - Bfw)/fw < -0.05$$

where GLR1 is a radius of curvature of a surface of the lens closest to the spatial optical modulating element, the surface facing the screen, GLnd is a refractive index at the d-line of the lens, Bfw is a air equivalent back focus of the zoom lens at a wide-angle end, and fw is a focal length of an entire zoom lens system at the wide-angle end.

2. (Canceled)

3. (Amended) The zoom lens according to claim 1, wherein the following conditional expression (2) is satisfied:

$$(2) \quad 5 < (GLR2 - Bfw)/fw$$

where GLR2 is a radius of curvature of a surface of the lens closest to the spatial optical modulating element, the surface facing the spatial optical modulating element.

4. (Amended) The zoom lens according to claim 1, wherein the following

conditional expression (3) is satisfied:

(3) $2.5 < fGL/fw < 3.5$

where fGL is a focal length of the lens closest to the spatial optical modulating element.

5. The zoom lens according to claim 1, wherein an Abbe number of the lens closest to the spatial optical modulating element is 30 or less.

6. The zoom lens according to claim 1, wherein the following conditional expression (4) is satisfied:

(4) $0.01 < PgFGL - 0.6457 + 0.0017 \times \nu dGL$

where PgFGL is a partial dispersion of the lens closest to the spatial optical modulating element, and νdGL is an Abbe number of the lens.

7. The zoom lens according to claim 1, wherein the following conditional expressions (5) and (6) are satisfied:

(5) $PgFGLn < 0.61$

(6) $(PgFGLn - PgFGL)/(\nu dGLn - \nu dGL) < -0.0027$

where PgFGLn is a partial dispersion of a negative lens closest to the spatial optical modulating element, $\nu dGLn$ is an Abbe number of the negative lens, PgFGL is a partial dispersion of the lens closest to the spatial optical modulating element, and νdGL is an Abbe number of the lens.

8. (Canceled)

9. (Canceled)

10. (Canceled)

11. (Canceled)

12. (Canceled)

13. (Canceled)

14. (Canceled)

15. (Canceled)

16. (Canceled)

17. (Amended) An image magnification projection system comprising:

a light source;

a spatial optical modulating element that is illuminated with light emitted from the light source and forms an optical image; and

a projection means for projecting the optical image formed on the spatial optical modulating element,

wherein the zoom lens according to claim 1 is used as the projection means.

18. (Amended) A video projector comprising:

a light source;

a means for temporally restricting light from the light source to three colors of blue, green and red;

a spatial optical modulating element that is illuminated with light emitted from the light source and forms optical images corresponding to the three colors of blue, green and red that are changed temporally; and

a projection means for projecting the optical images formed on the spatial optical modulating element,

wherein the zoom lens according to claim 1 is used as the projection means.

19. A rear projector comprising:

the video projector according to claim 18;

a mirror for bending light projected by the projection means; and

a transmission-type screen for displaying an image of the light bent by the mirror.

20. A multi-vision system comprising:

a plurality of systems, each of which comprises the video projector according to claim 18, a transmission-type screen for displaying an image of light projected by the projection means, and a cabinet, and

an image dividing circuit for dividing an image signal, and sending the divided image signal to each of the video projectors.